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Evaluation of Fungicides to Control Septoria Leaf Spot on White Alder at Humboldt Nursery

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ABSTRACT

Efficacies of benomyl, triadimefon, copper, and mancozeb were compared for control of Septoria leaf spot on white alder at the Humboldt Nursery, in northern California. Level of disease severity was lowest and height and caliper greatest in seedlings sprayed monthly with benomyl. Percentage of seedlings with stem infections was 1% for benomyl-treated versus 78% for untreated white alder. On the average, benomyl-treated seedlings were twice as tall and stem diameter twice as large as seedlings in all other treatments.

INTRODUCTION

The emphasis on wildlife habitat, biodiversity and increasing stumpage price for alder has increased the need for alder seedlings in northern California and Oregon. With the increased sowing of alder in the nursery has come an increase of Septoria alnifolia, a fungal parasite of alder. White alder is particularly susceptible to this pathogen. In 1988, over 140,000 white alder seedlings, 93% of Humboldt nursery's entire crop, were lost due to fungal infection. The red alder growing in the adjacent bed suffered only minor leaf spotting in the lower leaves.

In white alder, leaves become infected soon after leaves unfold and lesions develop 1 to 2 weeks later. Leaf spots are most numerous on the foliage of lower branches. They appear as black spots that enlarge to 1 to 15 mm in diameter. In areas where spots converge, larger necrotic blotches are evident. Cankers can develop if infection is early and severe. The fungus girdles the stem, killing the seedling.

The fungicides most frequently recommended for control of Septoria diseases include maneb, maneb and zinc, zineb, captan, dichloran and Bordeaux mixture

(Agrios, 1988). The objective of this trial was to determine which registered fungicide would be most effective in protecting against Septoria at Humboldt nursery.

METHODS

Plots were established in newly sown white alder at the USDA Forest Service Humboldt Nursery in northern California. A randomized complete block design was used with the 5 treatments replicated 4 times. Each replicate covered 20 feet of bed (4 x 5 foot plots) with the 5 treatments randomized down one nursery bed. The following treatments were applied monthly from May through November 1989 using a backpack sprayer:

1. benomyl (Benlate, 8 oz/100 gal)
2. triadimefon (Bayleton 50 WP, 8 oz/100 gal)
3. fixed copper (Tribasic copper sulfate, 3 lbs/100 gal)
4. mancozeb (Dithane M-45, 2 lbs/100 gal)
5. control (water only).

At the end of the growing season (December, 1989) 20 randomly selected seedlings from each plot were harvested for disease evaluation and growth measurements. Seedlings were clipped at the soil line, height and caliper at base measured, and disease incidence recorded. Disease incidence was measured by counting the number of seedlings with stem infections. Analysis of variance and Tukey test for pairwise comparisons were used to test for differences among means for seedling height, caliper and disease incidence.

RESULTS AND DISCUSSION

Monthly applications of benomyl protected seedlings from Septoria leaf spot. Height, caliper, and disease level were all significantly different from untreated controls ($p=0.05$). Benomyl-treated seedlings were over twice as tall and stem diameter twice as large as seedlings from all other treatments. Height and caliper of seedlings treated with triadimefon, copper, or mancozeb were not significantly different from control seedlings ($p=0.05$).

Seedlings treated with benomyl, triadimefon, or mancozeb had significantly fewer stem infections ($p=0.05$) then copper-treated or control seedlings. Benomyl-treated seedlings had few leaf spots and only 1% of the seedlings had stem infections. Triadimefon reduced stem infections to 20% of sampled seedlings. Infection level of copper-treated seedlings (44%) was not significantly different from control seedlings (78%) (Table 1).

Table 1. Height, caliper and percentage of seedlings with stem infections for white alder seedlings sprayed monthly for protection against Septoria alnifolia.

Treatment[1]	Height[2] (cm)	Caliper[2] (mm)	seedlings with stem infections[2] (percent)
benomyl	40.7 a[3]	6.6 a	1 a
triadimefon	19.4 b	2.7 b	20 ab
mancozeb	19.1 b	3.4 b	40 b
copper	19.1 b	3.2 b	44 bc
control	15.2 b	2.6 b	78 c

1. Rates used: benomyl - 8 oz/100 gal, triadimefon - 8 oz/100 gal, copper 3lbs/100 gal, mancozeb - 2 lbs/100 gal, control - water only.

2. Average of 80 randomly selected seedlings per treatment.

3. Values followed by the same letter are not statistically different (P=0.05).

Leaf spots, stem girdling, and seedling mortality occurred in all treatments. Infections on the stem often resulted in the area distal to the point of infection dying back. If this infection was on the main stem, the seedling died. If infection was on a lateral branch, then the side branch would die.

Stem infection was used as a measure of disease severity because it is a rough measure of amount of branch mortality and because at the time that test was evaluated there were large differences between the number of leaves present between treatments. The severely infected treatments (copper, mancozeb, and control) had few leaves still attached so leaf spot comparisons were not possible.

Literature reports that mancozeb protects seedlings from Septoria leaf spot (Agrios 1988). In this trial, mancozeb did not adequately reduce Septoria infection on white alder. Stem infections were present on 40% of the mancozeb treated seedlings. This was less than the untreated control where 78% of seedlings became infected on the stem but more than benomyl-treated seedlings (1% stem infection level).

Further testing is needed to determine the minimum number of benomyl sprays needed to control Septoria leaf spot of alder. Cultural and biological methods of control could also be evaluated. Triadimefon could be tried in alternation with benomyl to prevent fungal resistance to the fungicide from developing.

CONCLUSIONS

Benomyl (Benlate), applied monthly at 8 oz/100 gal throughout the growing season, effectively controlled Septoria leaf spot on white alder. Spray

treatment should be started at the time first leaves are fully emerged and continued throughout the growing season. Red alder seedlings should be monitored for disease development. If disease is detected, monthly sprays of benomyl may be needed.

LITERATURE CITED

Agrios, George. 1988. Plant Pathology, 3rd Edition. Academic Press, San Diego, Ca. pp. 357-359.

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